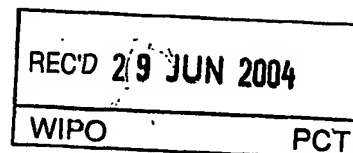




Australian Government

PCT/AU2004/000786

Patent Office
Canberra



I, JULIE BILLINGSLEY, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. 2003903192 for a patent by COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION as filed on 19 June 2003.



WITNESS my hand this
Twenty-fifth day of June 2004

JULIE BILLINGSLEY
TEAM LEADER EXAMINATION
SUPPORT AND SALES

**PRIORITY
DOCUMENT**
SUBMITTED OR TRANSMITTED IN
COMPLIANCE WITH RULE 17.1(a) OR (b)

BEST AVAILABLE COPY

Commonwealth Scientific and Industrial Research Organisation .

A U S T R A L I A

Patents Act 1990

PROVISIONAL SPECIFICATION

for the invention entitled:

"Jet device for mixing fluid"

The invention is described in the following statement:

JET DEVICE FOR MIXING FLUID

Field of the Invention

The present invention relates to a jet device particularly, but not exclusively, for mixing mono- or multi-phase fluid or a suspension in a large scale industrial tank or pool.

5 Background of the Invention

Large-scale industrial liquid and suspension tanks often experience poor flow circulation and sediment building up on a bottom of the tank. Poor mixing can cause material variation in fluid fed to downstream processing units.

10 Settling of particles can also lead to reduction in tank operating capacity and increased maintenance cost. For example, build-up of sludge sediment in crude oil tanks at oil refineries reduces effective tank working volume. Cleaning sludge sediment in these tanks is time consuming and labour intensive work. The tank down-time, direct cleaning and handling of sludge for disposal are significant costs to an oil refinery.

15 In the water industry, fine silt particles in a drinking water system build up in water storage tanks over time. Poor mixing in the tank leads to waste of chlorine dosed into the tanks. This leads to poor water quality for customers, and increased operating cost in tank cleaning and chlorine consumption.

Summary of the Invention

20 In accordance with the invention, there is provided a jet device with an outlet having a nozzle arranged to rotate as fluid exits the device, wherein the nozzle is adapted to feed fluid into a tank and cause mixing of the contents of the tank as a result of fluid flow from the rotating nozzle.

25 Preferably, the nozzle is adapted to rotate under action of flow momentum, resulting from fluid flow through the device. The nozzle is preferably laterally offset relative to a main housing of the device.

- 2 -

Preferably, the device includes a speed governor.

Preferably, the speed governor includes a paddle assembly operatively coupled to rotate under action of the rotating nozzle. Preferably, the paddle assembly is connected to a gear box which is in turn coupled to the output via a shaft extending substantially coaxially with respect to the output whereby flow resistance experienced by the paddle assembly is used to govern speed of rotation of the nozzle.

Brief Description of the Drawings

The invention is described, by way of non-limiting example only, with reference to the drawings, in which:

10 Figure 1 is a partially-sectioned perspective view of a jet device; and

Figure 2 is a plan view of the device.

Detailed Description

The rotating jet device 1 includes an inlet 2 coupled to a main housing 3 for fluid communication with an outlet 4. The outlet 4 is mounted in a bearing 5 for rotation relative to the main housing 3. The outlet 4 includes a nozzle 6 which is laterally offset relative to the main housing 3 and, in particular, arranged laterally with respect to a flow path, indicated by arrow 7, which passes from the inlet 2, through the housing 3, to the outlet 4. The change in flow momentum, of fluid exiting the nozzle 6 in an offset direction produces a torque which causes the nozzle 6 to rotate relative to the housing 3 in a counter-clockwise direction, when viewed in Figure 2.

The inlet 2 of the device may be connected to an end of a feed pipe (not shown) so that pressurised fluid from the feed pipe is jetted out of the nozzle 6 and into surrounding fluid in a tank, or the like, in a rotational manner.

Rapid rotation of the nozzle 6 may not be particularly beneficial for mixing purposes and a speed governor 8 is provided to dampen the rotational speed of the nozzle 6. The governor 8 includes a paddle assembly 9 which is coupled to the outlet 4 via a gearbox 10 and a

BEST AVAILABLE COPY

drive shaft 11 which is connected, via webs 12, substantially coaxially with respect to the outlet 4. Rotation of the outlet 4 and nozzle 6 thereby causes rotation of the drive shaft 11 which translates into a higher speed rotation of the paddle assembly 9. The paddle assembly 9 will experience flow resistance when the device is submerged in a tank and that
5 flow resistance will govern the speed of rotation of the nozzle 6, to improve mixing.

Since the jet device 1 expels fluid via the rotating nozzle, the effective mixing of the device 1 is substantially increased as compared to a stationary-type inlet nozzle. Further, the speed of rotation is automatically governed by the paddle assembly 9 so that only slow rotation of the nozzle 6 occurs, to help maximise mixing efficiency. Also, because the
10 rotation of the nozzle 6, and thereby the governor 8, is effected via flow momentum, from fluid passing through the device 1, no electrical power is required to drive the device. Accordingly, the device 1 is safe for use in mixing flammable liquids such as, for example, crude oil.

As such, the device may be installed in crude oil tanks which may typically be 60 to 70
15 metres in diameter. However, the device also has application to water storage tanks or any other suitable chemical, food, beverage or industrial waste-treatment tanks or pools, to improve mixing and to keep particulate matter in suspension during use, to thereby remove the requirement for tank off-line cleaning and the need to handle sediment or sludge which may result from improper mixing within the tank.

20 The device has been described by way of non-limiting example only and many modifications and variations may be made thereto without departing from the spirit and scope of the invention as described.

DATED this 19th day of June, 2003

25

Commonwealth Scientific and Industrial Research Organisation

By DAVIES COLLISON CAVE
Patent Attorneys for the applicant

1/2

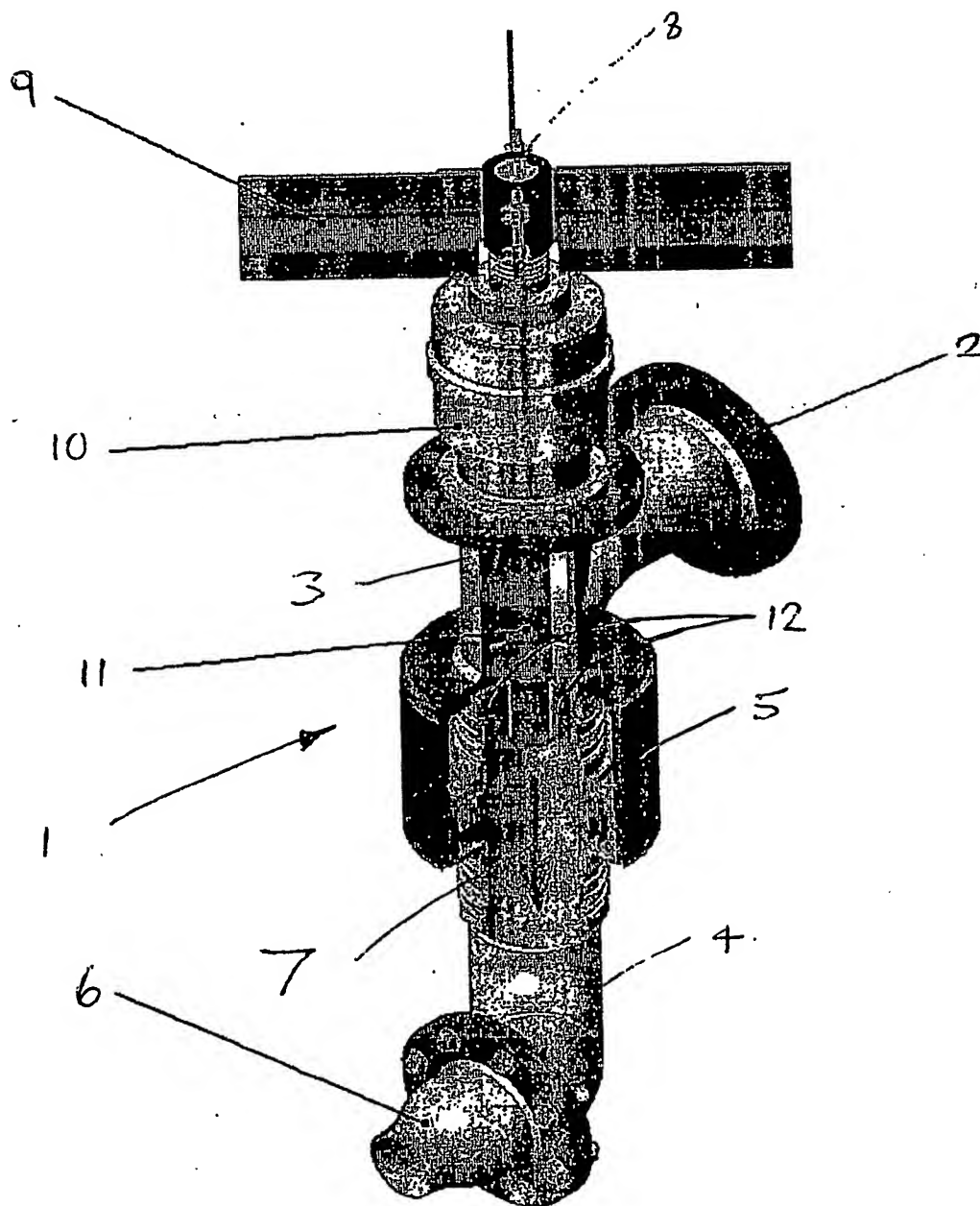


FIG 1

A technical drawing of a valve assembly, likely a gate valve, shown in a cross-sectional view. The drawing includes several numbered callouts: 1 points to the central gate or disc; 2 points to the top flange or connection; 3 points to the upper part of the valve body; 4 points to the lower part of the valve body; 5 points to the central hub or stem area; 6 points to the bottom flange or connection; 7 points to the lower part of the valve body; 8 points to the central hub or stem area; 9 points to the upper part of the valve body. Arrows indicate the flow direction, entering from the top and exiting from the bottom.

FIG 2